



# Newsletter

Volume 16, Number 6  
November - December 1999

Initially, I was introduced to Aldo Leopold's ideas when I was a graduate student at the University of Wisconsin-Madison. I was struck by the beauty of his writing and the clarity of his thinking. His logic and arguments were powerful and persuasive, for example: "We abuse land because we regard it as a commodity belonging to us. When we see land as a community to which we belong, we may begin to use it with love and respect." Aldo Leopold wrote this in *A Sand County Almanac*, which he completed just prior to his untimely death in 1948 and which has become a classic in the field of conservation, ecology and nature writing.

The Institute has many connections to Leopold. I currently am on the Board of Directors for the Aldo Leopold Foundation, and, with the family's approval, the Institute's patron society is named the Aldo Leopold Society. For this issue of the newsletter, IES ecologist Dr. Steward Pickett has written a piece commemorating the 50th anniversary of Leopold's famous essay on *The Land Ethic*.

The *IES Newsletter* is published by the Institute of Ecosystem Studies, located at the Mary Flagler Cary Arboretum in Millbrook, New York.

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Printing: Central Press, Millbrook, N.Y.

## The Land Ethic at 50

by Steward T.A. Pickett

The phrase, "The Land Ethic," was coined 50 years ago by Aldo Leopold as a title for his single most famous essay. He wrote, "A thing is right when it tends to preserve the integrity, and beauty of the biotic community. It is wrong when it tends otherwise." This disarmingly simple statement turns out to have been one of the founding ideas of the environmental movement. Many people who wish to conserve the biological richness of ecosystems, or to restore natural processes in damaged areas are guided by Leopold's land ethic. Inspired partly by his and his family's dedication to restoring a very abused farm in the so-called sand country of Wisconsin, his essay on the land ethic has become one of the most important and well known of environmental writings.

The land ethic emerged partly out of Leopold's understanding of ecology, and partly out of his personal experiences and values. Those who accept his ideas as an ethical tenet do so because they believe the values to be lasting. But ecology has changed and developed a great deal over the last 50 years. Can the land ethic still rest comfortably on a sound ecological footing?

New ecological knowledge has emerged since 1947 when "The Land Ethic" was finished. For example, ecologists now know that as ecosystems develop over time, not all processes change in unison, or end up at their maximum value. Biological richness is not necessarily the greatest in individual stands of forest that are the oldest. Productivity is not necessarily greatest in old ecosystems, although the mass of living and dead material may have accumulated to the maximum at that time.

There are new ecological disciplines. For example, when Leopold wrote, most ecological exploration had depended on horses, the Model T, trains and slow boats to China. Now there are satellites that send back fresh images of the entire surface of the globe every few weeks. Such images are based not only on visible light, but also on wavelengths of radiation that are beyond human visual perception. Such information provides a new window on the structure and dynamics of the Earth's ecosystems. At the other extreme, there are now routine ways to measure the activities of microscopic organisms, and to determine their genetic composition. Such methods have allowed the role of

previously neglected organisms to be discovered in ecosystems.

Altogether, the changes in knowledge and scales of observation have led to a major shift in ecological thinking since Aldo Leopold drafted his powerful essay. This new paradigm emphasizes that ecological systems are open to

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Aldo Leopold: forester, wildlife ecologist, conservationist, environmental philosopher and educator, and author of *A Sand County Almanac*. In his introduction to the 1987 edition, Robert Finch writes: "No other single book of American nature writing — with the exception of *Walden* — has achieved such lasting stature as *A Sand County Almanac*. Since it was first published by Oxford in 1949 — one year after the author's death — it has become an established classic in the field, admired by an ever-growing number of readers, imitated by hundreds of writers, and providing the core for modern conservation ethics."

# A Powerful Plant Experience

*"It's a jungle in there! ... Where are the monkeys? ... Where are the snakes? ... Got any dinosaurs? ... Mowgli must live here! ... What do you DO with all these plants?" ... Excited shouts echo around the entrance to the greenhouse as school children begin a "treasure hunt" in its tropical unit ...*

Anyone who has visited the Institute of Ecosystem Studies' greenhouse probably can put her- or himself behind the eyes of these children, because turning into the glass-enclosed abundance of flowers, fruits and foliage reaching to the sky is like stepping into another world. And this abundance is a perfect venue for the Treasure Hunt: children look for roots taller than they are, leaves bigger than their bodies, buds larger than their thumbs, as well as for other plants and the resident animals that help make up a healthy greenhouse ecosystem. Then they meet under the magnificent staghorn fern and relate their observations to the functions of plant parts and the ecosystem in general.

This Treasure Hunt is part of Plant Power, one of the Institute's ecology field programs for school groups. Plant Power, developed several years ago by former IES ecology educators Buzzy Hayes, Elena Bennett and Kris Desmarais, teaches third-, fourth- and fifth-graders about plant growth and reproduction. The two-hour program engages children in hands-on activities that investigate plant parts and function; plant growth; the role of air, water, sunlight and soil; pollination; and interactions between plants and animals. During the fall 1999 term, 17 classes from across the Hudson Valley visited the IES greenhouse, where Joan Doyle, program leader in ecology education; Jennifer Purrenhage, ecology education project assistant; and Amy Brush, AmeriCorps ecology instructor — working in teams of two — helped students discover the power of plants.

A typical Plant Power program begins when a class, which can range in size from a small home-school group to an elementary school busload, gathers for a brief introduction to IES, the work of the greenhouse, and plants in general. Following the usual cautions ("You may touch the plants, but gently, please ... No running through the greenhouse ...", and so forth), the educators organize a Circle Photosynthesis Game. From their feet (= roots) to their faces (= flowers), the

children become plants. Their roots "collect" water, their leaves (= hands) collect sunlight and carbon dioxide, and they learn how — as plants — they photosynthesize to make sugar, their food, from these things they have collected from the ecosystem.



*In the IES greenhouse, AmeriCorps ecology instructor Amy Brush, left, and parent Ms. Karen Parrinello, rear, help 5th graders collect data on the growth of kidney bean plants. The students are in Ms. Jessica Browne's class at the Alden Place Elementary School in Millbrook, N.Y.*

Next is the Treasure Hunt — 25 minutes of structured exploration of the tropical unit — followed by the Kidney Beans Experiment, which investigates "How do we know what plants need to grow?". Now, students become IES scientists. Working in teams, they engage in the process of scientific inquiry and develop hypotheses about how seedlings react to different treatments. What happens when kidney beans are grown in sand, without the nutrients and water-retention qualities of soil? And when they're grown under a box, without light, what happens to their ability to make food? By comparing experimental plants with controls planted in soil and grown in the bright light of the greenhouse, the students gather data to support their hypotheses. This opportunity to do real science is one of the aspects of the program that receives the highest praise from teachers in their post-visit evaluations.

The last activity is the Pollination Game. Here, students discover how pollinators and flowers have coevolved for mutual benefit. They learn, for example, how the long bills of hummingbirds are especially well-suited to reach nectar deep in tubular-shaped flowers, while flies are attracted by flowers with flat surfaces and strong odors, such as Queen Anne's lace. And they see how pollen sticks to the birds' and insects' bodies, and in that way catches a ride to other flowers.

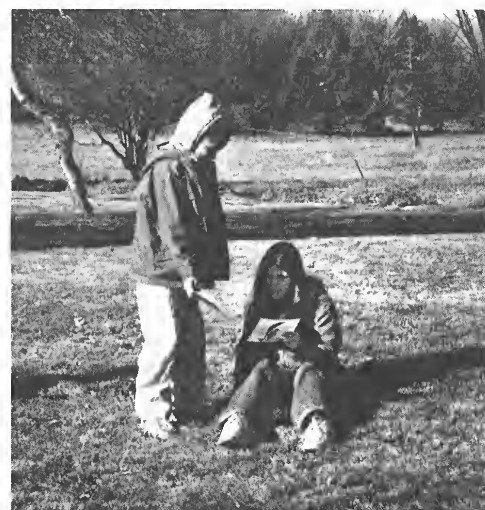
Before Plant Power ends, the educators lead a wrap-up session, where students put together what they have learned. Overlays on a velcro board help them visualize the cycle: pollination enables seed formation; plant growth produces roots, stem and leaves; and finally the

plant flowers, is pollinated, produces a seed .... and the cycle begins again.

All of the Institute's Ecology Field Programs are aligned with the National Research Council's National Science Education Standards, which were released in December 1995. The standards define the science content that all students should know and be able to do, and provide guidelines for assessing the degree to which students have learned that content. Among the recommendations are inquiry-based science programs, and Plant Power is such a program.

Institute educators have expanded the Plant Power curriculum and now offer a program for middle school students, with more sophisticated scientific experimentation.

Teachers who enroll their classes in any of the IES Ecology Field Programs receive handouts with guidelines for pre- and post-visit activities, and professional development also is available. For information, call the IES Education Program office.



*Krystal Maisone (standing) and Kaitlin Rudy compare notes during Plant Power, an IES Ecology Field Program.*

influences from other places, and that those influences can sometimes control the structure and function of a particular ecosystem. In addition, ecologists now recognize that ecological systems have many modes of change and development, and that those processes may not lead to the same end point in all systems. Also, by looking at systems over the long term, ecologists have discovered that natural disturbances – fires, floods and windstorms – are an important ingredient in molding ecosystems. The long-term and geographically extensive approaches now available to ecologists have exposed the pervasive, if sometimes subtle, role of humans as components of ecosystems. For example, the legacy of land use by people and cultures that no longer are present in an ecosystem can still be seen in the structure and function of those systems today.

There are other important issues that intersect with the land ethic today. Leopold emphasized that humans are part of the land community. What are the implications of the growth of human population to 6 billion today? There were 2.4 billion when Leopold wrote in 1947. How can these additional hands, gastrointestinal tracts, and dreams be accommodated in a way that preserves the integrity of the land on which we all ultimately depend?

When Leopold wrote, the distribution of wealth – access to resources – was much more equitably distributed than now. For example, even in the United States the gap between rich and poor has grown. According to the World Resources Institute, in 1970 the wealthiest 20% of Americans earned four times the income of the poorest 20%; by 1993, that disparity had grown to 13 times. This says nothing about the extremes that exist between wealthy and poor nations. What ethical stance should there be to equity as we consider our interaction with the rest of the land community?

In 1947, the majority of the population in the United States and the world lived on farms and towns. Now about 75% of the

US population lives in and near cities, and nearly 50% of the population of the entire world is urban. The proportion of the US and world populations in urban areas continues to increase. How can city residents, suburban lawn jockeys, and exurban refugees, all of whom are part of an interconnected urban economic, infrastructure, and resource-use system, relate to the land ethic?

These questions can be reduced to a single overarching question: Is the land ethic

understood and believed the fact of our dependence on ecological processes, the land ethic might in fact become a part of the moral tool kit of all humans, regardless of our individual roles in society and an increasingly global economic system. Third, the inequitable distribution of wealth leads to behaviors and decisions that damage the land. Conspicuous consumption, on the one hand, and subsistence in marginal lands on the other, both damage the land as a result of a thoughtlessly adopted or imposed short-term view of land as resource. Finally, we need to discover ways in which urbanization can be a solution to issues identified in the land ethic, rather than sources of environmental woes. How can urban spread and urban revitalization increase the efficiency of human resource use and waste processing? How can improvements in the layout of our urban-suburban-exurban complex reduce the pressure to convert more and more wild land to tame and paved land? How can we exploit and improve urbanization to enhance our ethical stance toward the land?

The land ethic must be seen to embrace cities and other settled areas in addition to rural and wild areas as part of the land. In essence, all of these subdivisions of "the land" are managed and affected by people to different degrees. Leopold's land ethic is broad enough to lead us to value the ecological aspects and processes that take place in all these places and to see the connections between them. An ethical stance helps people to see the environmental implications of decisions and choices that they make downtown as well as in the isolation of the seemingly wildest places on Earth.

### The Institute's Aldo Leopold Society

With the endorsement of Leopold's family, in 1994 the Institute of Ecosystem Studies established a new membership program, The Aldo Leopold Society. The Institute and the Society share Leopold's commitment to the environment, and we work to improve the public's understanding of ecological systems.

With their annual contributions, Society members support the excellent research and education done at IES. In return, members are invited to special events at the Institute. These events often feature presentations by IES scientists who describe their research discoveries and advances in education, frequently before the information is made available to the general public.

The Aldo Leopold Society calendar for 2000 includes a winter luncheon in the IES Greenhouse, at which Institute Director Dr. Gene E. Likens will speak on a pressing environmental issue. A reading of Aldo Leopold's work will highlight a reception in April, and, in June, members are invited to join an ecological landscape tour, visiting three local gardens for a first-hand look at ecological garden designs and concepts.

If you would like additional information on The Aldo Leopold Society, please contact Jan Mittan at 914-677-5343.

relevant today? First, the shift in ecological paradigm moves the land ethic from apparent dependence on a static and idealized view of ecological systems to a multifaceted and dynamic one. Ethically, a thing is right if it preserves the capacity of the land – an ecological system – to adjust to changing natural conditions and human stresses. The ethical judgement rests on the continuity of living systems and their flexibility in the face of internal and external changes. Second, the immense growth of the Earth's human population is all the more reason to apply the land ethic. The basic resources of clean air, clean water, and buffering of extremes have to be shared among an almost unimaginably huge number of people. The land – that is, functioning ecosystems – is the machine that generates these services. If all 6 billion of us

#### Aldo Leopold Reading List

- by Aldo Leopold:
  - *A Sand County Almanac*
  - *Game Management*
- by Aldo Leopold, et al.:
  - *For the Health of the Land: Previously Unpublished Essays and Other Writings*
  - *Round River: From the Journals of Aldo Leopold*



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Nonprofit Org.  
US Postage  
PAID  
Millbrook, NY  
Permit No. 16

Printed on  
100% Recycled  
Paper

### Calendar

#### CONTINUING EDUCATION

For winter/spring 2000 program information, or to request a catalogue, call the Continuing Education office at 914-677-9643. Upcoming programs include:

##### *Gardening*

- Jan. 29 (6 sessions): **Soil Science**  
Feb. 3 (6): **Commercial Greenhouse Mngmnt.**  
Feb. 12: **Ornamental Grasses in the Garden**  
Feb. 26: **Topiaries, Standards and Beyond**  
Feb. 26: **What's in a Name? Understanding Botanical Names**  
Mar. 4: **Creating the Ornamental Vegetable Garden**

##### *Landscape Design*

- Jan. 19 (7): **Graphics I**  
Feb. 3 (8): **Principles of Landscape Design**  
Feb. 7 (8): **Construction I**

##### *Natural Science Illustration*

- Jan. 9 (4): **Watercolors in the Greenhouse — Special Topics**  
Feb. 7 (6): **Drawing III**  
Feb. 13 (3): **Watercolors in the Greenhouse — Special Topics**

##### *Biology and Earth Science*

- Jan. 25 (8): **Basic Botany**

##### *Workshop*

- Mar. 1: **Selling a House by the Yard**  
*Ecological Excursions and Garden Tours*  
Mar. 13: **New England Flower Show**

##### *Natural Science Book Club*

The IES Continuing Education Program sponsors a book club that explores titles in the fields of gardening, natural history, landscape design and environmental science. Open to the public, the gatherings bring together those with dual interests in nature and reading. Free. Call (914) 677-9643 for information.

#### VOLUNTEER OPPORTUNITIES

##### *Current needs include:*

**Education Program Office:** weekday telephone reception

**The Ecology Shop:** weekday and weekend visitor orientation and/or customer assistance

Call Ms. Su Marcy at 914-677-7641.

#### IES SEMINARS

Free scientific seminars are held each Friday from September until May at 11:00 a.m. in the IES Auditorium on Route 44A.

- Jan. 14: **Biodiversity as a Commodity.** Dr. Geoffrey Heal, Columbia Business School  
Jan. 21: **Ecosystem Restoration of Lake Okeechobee, Florida.** Dr. Alan D. Steinman, South Florida Water Management District  
Jan. 28: **The Soil and Foliar Foodwebs.** Dr. Elaine Ingham, Oregon State University  
Feb. 4: **The Mussel *Musculista senhousia* in Mission Bay, San Diego: Broad Perspectives on the Role of an Exotic Species in an Invaded Ecosystem.** Dr. Jeffrey Crooks, Smithsonian Environmental Research Center  
Feb. 11: **DIRECTOR'S PROGRAM FOR VISITING SCIENTISTS: Evaluating the Source of Streamwater Nitrate Using <sup>15</sup>N and <sup>18</sup>O in Nitrate.** Dr. Linda Pardo, USDA Forest Service, Burlington, Vt.  
Feb. 18: **The Hudson River's Humans and Nature: Nature, Polis and Ethics.** Dr. Strachan Donnelly, The Hastings Center, Garrison, N.Y.  
Feb. 25: **To be announced.**

#### THE ECOLOGY SHOP

New in the Shop ... local crafts are here: recycled-tie purses by Beth Hayes and wrought iron works by Dennis Marcy; more soon! ... for children ... puzzles ... triazzles ... animal finger puppets ... and in the Plant Room ... mud-gloves, foxgloves and kidskin gloves ... *Burt's Bees'* products  
Senior Citizens Days: 10% off on Wednesdays

- Gift Certificates are available •

#### HOURS

Winter hours: October 1 - March 30

Public attractions are open Mon. - Sat., 9 a.m.-4 p.m. & Sun. 1-4 p.m., with a free permit.  
(Note: The Greenhouse closes at 3:30 p.m. daily.)  
The IES Ecology Shop is open Mon.-Fri., 11 a.m.-4 p.m., Sat. 9 a.m.-4 p.m. & Sun. 1-4 p.m.  
(The shop is closed weekdays from 1-1:30 p.m.)  
• Free permits are required for visitors and are available at the IES Ecology Shop or the Education Program office daily until 3 p.m.

#### GREENHOUSE

Does the weather in January and February make you yearn for greener vistas? Visit the IES greenhouse, a year-round tropical plant paradise and a site for controlled environmental research. Winter highlights include the citrus collection, papaya trees, scented geraniums, the herb collection, and bird-of-paradise plants. The greenhouse is open until 3:30 p.m. daily with a free permit (see HOURS). Closed public holidays.

#### MEMBERSHIP

Join the Institute of Ecosystem Studies. Benefits include subscription to the newsletter, member's rate for courses and excursions, a 10% discount on IES Ecology Shop purchases, and participation in a reciprocal admissions program. Individual membership: \$30; family membership: \$40. Call Ms. Laura Corrado in the Membership Office at 914-677-5343.

##### **The Institute's Aldo Leopold Society**

In addition to receiving the benefits listed above, members of The Aldo Leopold Society are invited guests at spring and fall IES science updates. Call Ms. Jan Mittan at 677-5343.

#### TO CONTACT IES ...

... for research, graduate opportunities, library and administration:

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... for education, general information and the IES Ecology Shop:

Institute of Ecosystem Studies  
Education Program, Box R  
Millbrook NY 12545-0178

Tel: 914-677-5359 • Fax: 914-677-6455

IES Ecology Shop: 914-677-7649

Street address: Gifford House Visitor and  
Education Center, Route 44A, Millbrook, N.Y.

... IES website: [www.ecostudies.org](http://www.ecostudies.org)

For information on current IES public events and attractions, visit: [www.ecostudies.org/welcome/ThisWeek.html](http://www.ecostudies.org/welcome/ThisWeek.html).

For garden tips, follow the link to the Perennial Garden Archives.